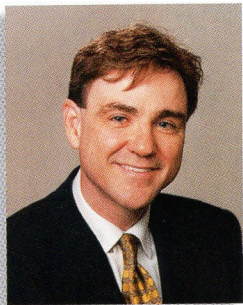


# IPS EMPRESS CROWN

*On The Maxillary Right Central Incisor*

by DOUGLAS A. TERRY, D.D.S.



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## ABSTRACT

The patient presented requesting esthetic improvement of the maxillary right central incisor (tooth #8). The ceramo-metal crown on the maxillary right central incisor was replaced with a leucite-reinforced, pressed glass ceramic crown (IPS Empress, Ivoclar), in order to achieve the proper gradient of translucency which would allow optimal integration and harmony with the adjacent dentition.

## BASIC PROCEDURES

- a. Empress veneer preparation
- b. Technique case with laboratory model
- c. Provisionalization
- d. Radiographs of crown intact with preparation design
- e. Polyether impression material
- f. Lab diagram
- g. Rubber dam placement and cementation
- h. Bonding of restoration.

## MAIN FINDINGS

Light transmission properties of ceramo-metal porcelain crowns are different from those of leucite reinforced ceramic systems. These tooth colored materials provide an enhanced biocompatibility to the periodontium. The clinical closeness of color due to dehydration when opening the mouth was difficult to capture through photography.

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## PRINCIPAL CONCLUSIONS

Through utilization of the all-ceramic system and proper operative procedures, a natural appearance revealing a satisfactory integration with the surrounding tissues was reinstated for the patient.

## INTRODUCTION

The revolution in esthetic dentistry has offered the clinician and the patient a multitude of options when selecting a particular treatment. A variety of new materials and enhanced application techniques have been developed to improve the appearance of the anterior dentition. Tooth colored, biocompatible materials are now available that enable the clinician to achieve restorations that are indistinguishable from natural dentition.

The traditional ceramo-metal crown, though valued for its strength, disheartens a considerable number of patients who wish to improve the appearance of their smiles. The exposed metal collar of the ceramo-metal crown has discouraged numerous potential candidates.<sup>1</sup> Due to the underlying metal framework, the light transmission properties of ceramo-metal are different from those of natural dentition.<sup>2,3</sup> The incidental light is

completely blocked by the metal substructure of the ceramo-metal device which causes the characteristic shadow at the sub-marginal zone.<sup>4</sup> When esthetics is of primary concern, the selection of skillfully fabricated appropriate materials becomes an important factor.<sup>5</sup> As a result, all-ceramic crowns are now utilized routinely in the anterior region, due to the absence of opaque substructure and the light transmission characteristics.

Numerous porcelain systems are currently available and offer ever expanding esthetic possibilities to the practitioner.<sup>6</sup> This case presentation entails the utilization of an innovative system: the leucite-reinforced, pressed glass ceramic system (IPS Empress, Ivoclar).

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*These tooth colored materials provide an enhanced biocompatibility to the periodontium.*

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Figure 1: Pre-operative of full face.

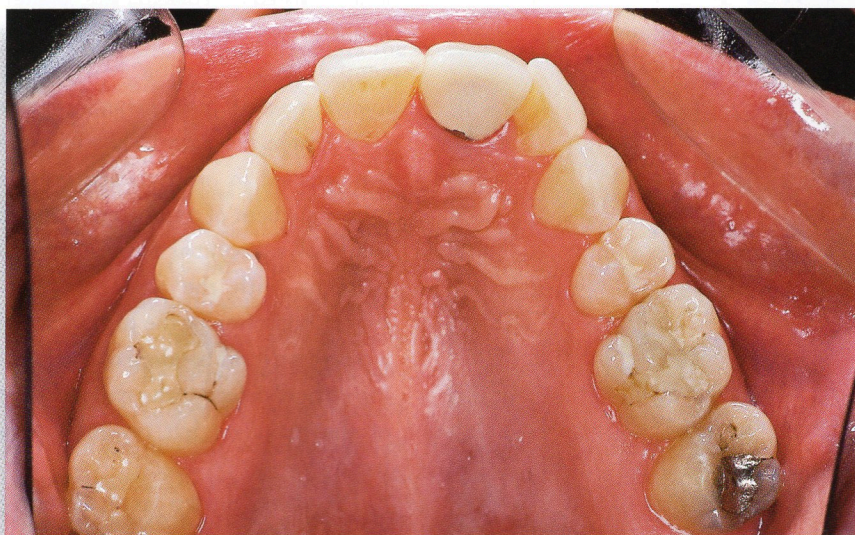


Figure 2: Pre-operative of maxillary arch.

## HISTORY

A 33 year-old female patient presented requesting esthetic improvement of the maxillary right central incisor, tooth #8. (Figure 1) The previous dental care of the patient had been limited to routine dental examinations, radiographs, prophylaxis, and minor restorative care. The maxillary first bicuspids had been removed at the age of 12 for orthodontic improvement, and the third molars had been removed at the age of 23. (Figure 2)

## CLINICAL EXAMINATION

Clinical examination disclosed that 26 teeth were present. Oral hygiene was excellent, and oral cancer screening confirmed that all tissues were within normal limits. Radiographic examination revealed that the alveolar support was normal. Previous restorative care was limited to amalgam and composite restorations, sealants on the posterior teeth, and a ceramo-metal crown on the maxillary right central incisor.

The patient presented with a Class II molar relationship and Class I cuspid relationship with maxillary first bicuspids missing. The maxillary arch was slightly constricted, and the mandibu-



Figure 3: Pre-operative of maxillary arch.

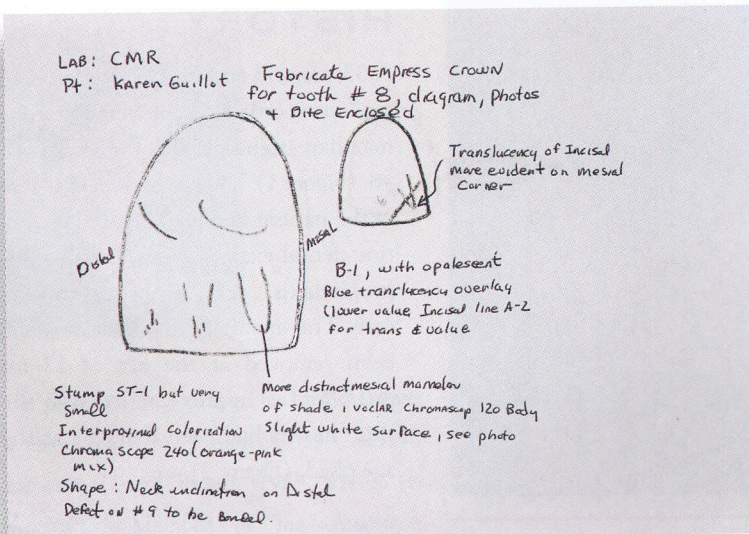


Figure 4: Diagram of Shade Mapping.

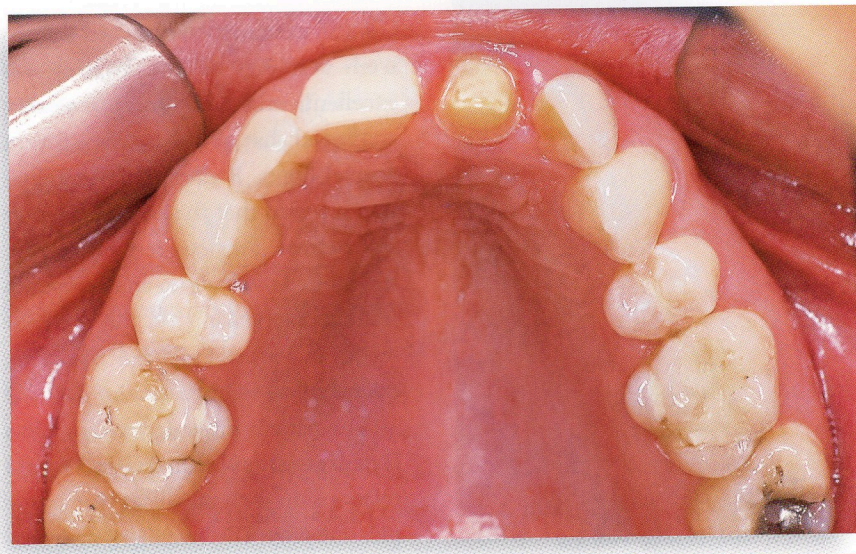


Figure 5: Crown Preparation.

lar cuspid were in labial crossbite. The mandibular midline was deviated to the left by 3 mm. A slight crowding was present in the maxillary arch and a moderate crowding in the mandible. Group function was present bilaterally, with moderate amount of wear of the mandibular incisors.

*Through utilization of the all-ceramic system and proper operative procedures, a natural appearance revealing a satisfactory integration with the surrounding tissues was reinstated for the patient.*

## DIAGNOSIS

The gingival tissue around the existing ceramo-metal crown on the maxillary right central incisor was enlarged and bluish to pink in color; the gingiva was not stippled. (Figure 3) The shape, contour, and shade of the incisor required restorative attention and esthetic enhancement.

## TREATMENT PLAN

The treatment plan was formulated and consisted of replacing the ceramo-metal crown on the maxillary right central incisor with a leucite-reinforced, pressed glass ceramic crown (IPS Empress, Ivoclar). The material was selected in order to achieve the proper gradient of translucency, which would allow optimal integration and harmony with the adjacent dentition.<sup>7,8</sup> Additionally, the plan included a complete resin bonding of the existing enamel defect at the gingival crest of the maxillary left central incisor tooth #9.

Diagnostic models were fabricated from maxillary and mandibular alginate impressions and sent to the laboratory along with 35 mm photographs and

bite registrations. The shape, form and function were evaluated from the diagnostic models. The laboratory prepared a diagnostic wax up and this was presented to the patient for examination prior to initiating the treatment. The shade selection had been reviewed with the patient and the laboratory at several prior appointments. Photographs were taken with different shade tabs. Due to the complexity of the shade, it was necessary to diagram (color map) the tooth in extensive detail, designating the exact location of tints, shades, and the location of existing characterizations. (Figure 4) Intraoral photographs (both 1:1 and 2:1, 35 mm) were taken of the mesiofacial and distofacial aspects of the tooth to be matched in order to achieve appropriate characterization of the restoration.

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## CLINICAL PROCEDURE

### PREPARATION

Anesthesia was administered, and the gingiva was retracted with nonmedicated retraction cord (#00 Ultrapack/Ultradent). A #1558 high-speed bur under Zeiss 4.5X magnification was used to remove the existing ceramo-metal crown. The area was debrided with hydrogen peroxide, and the tooth preparation was carefully inspected. The facial and lingual surfaces were reduced by approximately 1.5 mm, and all sharp edges and angles were rounded. The margins were located at the gingival crest or slightly into the sulcus. Following preparation, the teeth were carefully examined, debrided, and rinsed with hydrogen peroxide.



Figure 6: Evaluation of margins in relationship to the gingival crest.

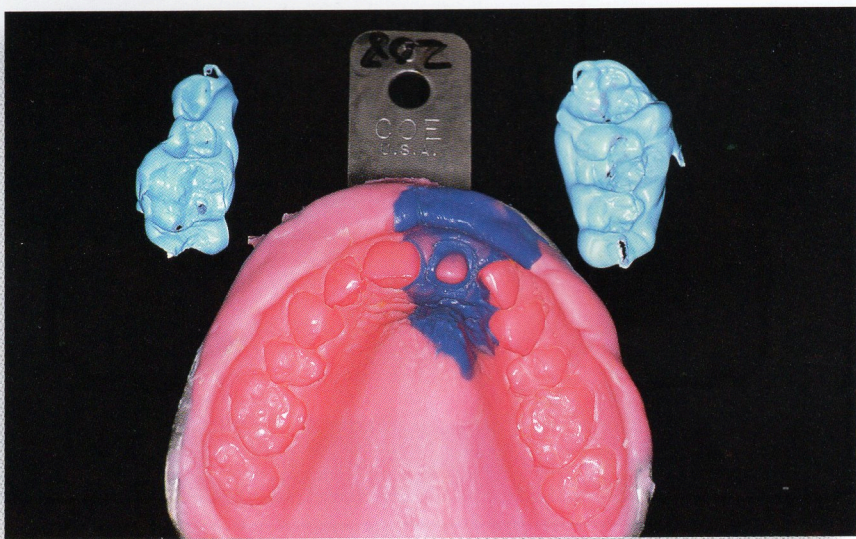


Figure 7: Impression with bite registration.



Figure 8: Provisional restoration.

All finish lines were inspected, and any sharp edges were refined as necessary. The gingival areas of the teeth were carefully cleansed with hydrogen peroxide, thoroughly rinsed, lightly dried, and examined. (Figure 5)

An existing mesiofacial defect at the gingival crest at the maxillary left central incisor (tooth #9) was slightly prepared with 1/2 round carbide bur. The surface was retracted with non-medicated cord (#000 Ultrapak/

Ultradent). The area was pumiced, and an antibacterial agent (Concepssis Scrub, Ultradent) was applied to the preparation with a cotton pellet for 15 seconds. The preparation was then etched with 37.5% phosphoric acid for 20 seconds and lightly air dried. Several coats of ONE-STEP adhesive were applied and thoroughly air dried for ten seconds to remove excess solvent and water. The surface was inspected for a glossy appearance and

then light cured for ten seconds. Renamel body B-1 was applied with a Cosmedent 8A, smoothed with IPC, and cured for 40 seconds. The composite was finished with a finishing bur (Brasseler ET9), followed by other finishing burs (ET6F, ET6EF, Brasseler), fine and extra-fine finishing discs (Cosmedent), and rubber polishing cup. The composite was then polished with a felt wheel and Enamelize polishing paste.

## PROVISIONALIZATION

A provisional restoration was made chairside from an alginate impression and provisional material (Luxatemp) to be worn while the custom composite provisional restoration was fabricated in the laboratory. The patient was instructed to rinse three times a day with warm salt water.

On the appointment to seat the fabricated provisional restoration, local anesthesia was administered. The provisional restoration was removed, and the margins were evaluated in relationship to the gingival crest. (Figure 6) The preparation was re-packed with nonmedicated cord and allowed to remain in place for five minutes. The cord was then moistened and removed. The area was rinsed and lightly air dried. An impression was taken with a polyether impression material in a full arch tray. A standard injection wash technique was followed by placement of the tray material. The impression was rinsed, dried, and carefully inspected. Bite registrations were taken (Figure 7), and the new composite provisional restoration was luted with temporary eugenol-free cement. (Figure 8)

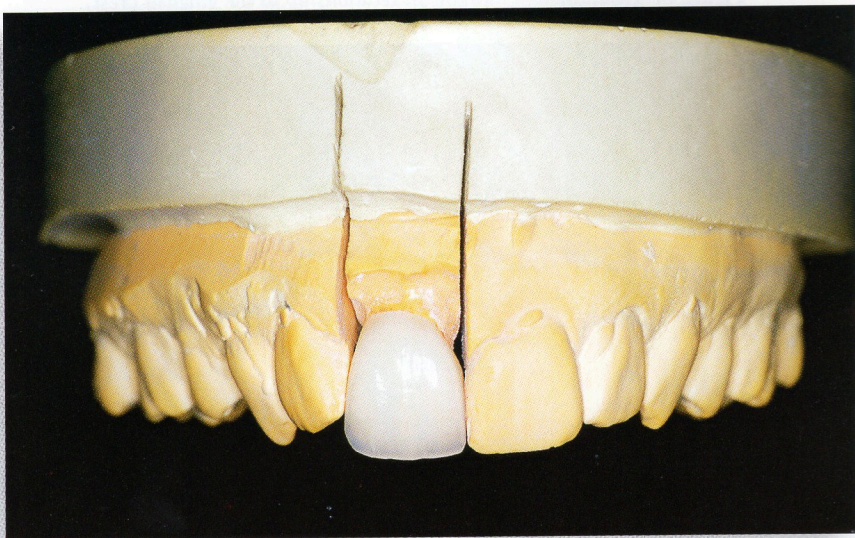


Figure 9: Inspection of crown on laboratory model.



Figure 10: Removal of excess cement with sable brush.

## LABORATORY INSTRUCTIONS

A prescription was written and sent to the dental lab for the fabrication of a crown for the maxillary right central incisor. The shade was described in detail using a color-mapping diagram with precise designation of the exact location of tints, shades, and the existing characterization. Intraoral photographs of the mesiofacial and distal aspects of the tooth to be matched were also sent to the laboratory to permit appropriate characterization of the crown.

## TRY-IN

A visual inspection of the crown was performed upon return from the laboratory. (Figure 9) The restoration was placed on a laboratory model to ensure complete seating and adequate contacts. The dimensions were observed, and the shape and contour were compared to the adjacent central incisor. The margins were inspected under surgical telescopes (Zeiss 4.5X magnification) and found to be precise. The internal surfaces of the crown were inspected for a uniform, frosted appearance. The shade was compared to the selected shade tabs and photographs, and the diagram was reviewed.

Local anesthesia was administered, and the crown was tried in with shade paste. Color harmony had been achieved. The contours of the crown were evaluated prior to seating, and the patient and the author/clinician viewed the restoration from an upright position. Slight modifications were performed in the contours of the restoration, and the restoration was polished.

The crown was carefully scrubbed with a soft toothbrush and rinsed thoroughly. A 37.5% phosphoric acid gel etchant was applied to the internal sur-



Figure 11: Post-operative radiograph.



Figure 12: Post-operative of maxillary arch.

face of the crown to act as a decontaminating agent, rinsed off immediately, and air dried. The internal surface of the restoration was silanated and dried. The preparation was now ready for bonding.

## CEMENTATION

A rubber dam was placed on the maxillary arch to prevent moisture contamination. A single strand of nonmedicated retraction cord was placed in the sulcus. The preparation was pumiced, and an anti-bacterial agent (Concepsis Scrub, Ultradent) was applied to the preparation with a cotton pellet for 15 seconds, rinsed for 30 seconds, and lightly air dried. The dentin primer (Nexus 1) and activator (Nexus 2) were applied separately and air thinned. The adhesive agent (Nexus 3) was applied and air thinned.

The catalyst and base were mixed in equal amounts for 10 to 20 seconds, and an even coat was placed on the internal surface of the crown, including the margins. The restoration was gently seated, and the margins were evaluated with an explorer while holding firmly in place. The excess cement was removed by using a sable brush

(#000). (Figure 10) It is important to leave a residual amount at the margins to counteract any polymerization shrinkage of the cement.<sup>9</sup> Once the position of the crown was satisfactory, the crown was spot cured in the center of the facial surface for 20 to 30 seconds using a small (2 mm to 3 mm) light curing tip. A thin layer of glycerin was applied to the margins to prevent formation of an air inhibited layer. The crown was cured for two minutes with two Optilux curing lights with large diameter tips. Excess resin was removed with Bard Parker blades (#s 12 & 15).

## FINISHING

The final polishing was achieved with rubber porcelain polishing wheels, cups, and diamond polishing paste (Vident). The interproximal and cervical areas were evaluated with dental floss to ensure adequate contact and the absence of gingival overhangs. A post-operative radiograph (Figure 11) verified the absence of gingival overhangs. The occlusion was evaluated by having the patient close gently and without force. Finishing diamonds were used to

equilibrate the porcelain in centric, protrusive and lateral excursions. It is important that the restoration provide the proper anterior guidance and not cause fremitus in centric occlusion.<sup>10</sup>

## CONCLUSION

In 1956, Frush and Fisher compared an optimal smile with a stage, where the two dominant actors are played by the central incisors and where the lateral incisors must not antagonize them in any way.<sup>11</sup> This presentation exemplifies the esthetic results that can be accomplished when there is communication and understanding between the ceramist, the dentist, and the patient. Through utilization of the all-ceramic system and proper operative procedures, a natural appearance revealing a satisfactory integration with the surrounding tissues was reinstated for the patient.<sup>12</sup> (Figures 12 & 13) *AB*

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Figure 13: Post-operative of full face.